

# OPTIMALISASI RUTE DISTRIBUSI DENGAN ALGORITMA ANT COLONY OPTIMIZATION UNTUK MENGURANGI BIAYA TRANSPORTASI DAN EMISI KARBON (STUDI KASUS : PT XYZ)

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## ABSTRAK

PT XYZ merupakan perusahaan distributor produk kosmetik di Kabupaten Cirebon. Perusahaan ini melayani pelanggan di beberapa kecamatan di Kabupaten Cirebon. Saat ini, PT XYZ sedang menghadapi beberapa permasalahan yaitu biaya distribusi tinggi dan produk sering terlambat tiba di toko pelanggan. Selain itu, PT XYZ juga mempunyai visi memberikan layanan distribusi yang ramah lingkungan, salah satunya dampak emisi karbon yang dihasilkan oleh kendaraan distribusi. Terdapat batasan juga dimana satu kendaraan hanya bisa melakukan pengiriman sebanyak satu kali dalam sehari. Oleh karena itu, penelitian ini bertujuan memberikan usulan rute distribusi yang lebih pendek (optimal) serta ramah lingkungan dengan menggunakan algoritma *Ant Colony Optimization* (ACO) konvensional dan *Hybrid Nearest Neighbor-ACO* (NN-ACO) dengan pertimbangan parameter  $\alpha$  (pengendali intensitas *pheromone*),  $\beta$  (pengendali visibilitas) dan  $\rho$  (intensitas penguapan *pheromone*). Setelah rute usulan hasil perhitungan algoritma ACO dan *Hybrid NN-ACO* didapatkan, selanjutnya dilakukan perbandingan antara rute usulan ACO, *Hybrid NN-ACO* dan rute eksisting. Didapatkan algoritma *Hybrid NN-ACO* menghasilkan nilai yang lebih baik daripada rute eksisting dan algoritma ACO yaitu meminimalkan total jarak tempuh pada hari senin sebesar 40,48%, hari selasa sebesar 53,27%, hari rabu sebesar 44,12%, hari kamis sebesar 47,85%, dan hari jumat sebesar 51,04%.

**Kata Kunci** : Distribusi, Optimasi, *Ant Colony Optimization*, *Hybrid Nearest Neighbor-ACO*, Emisi Karbon

***DISTRIBUTION ROUTE OPTIMIZATION USING ANT COLONY  
OPTIMIZATION ALGORITHM TO REDUCE TRANSPORTATION COSTS  
AND CARBON EMISSIONS (CASE STUDY: PT XYZ)***

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***ABSTRACT***

*PT XYZ is a cosmetic product distributor company in Cirebon Regency. This company serves customers in several sub-districts in Cirebon Regency. Currently, PT XYZ is facing several problems, namely high distribution costs and products that often arrive late at customer stores. In addition, PT XYZ also has a vision of providing environmentally friendly distribution services, one of which is the impact of carbon emissions produced by distribution vehicles. There is also a limitation where one vehicle can only make deliveries once a day. Therefore, this study aims to provide a shorter (optimal) and environmentally friendly distribution route proposal using the conventional Ant Colony Optimization (ACO) algorithm and Hybrid Nearest Neighbor-ACO (NN-ACO) with consideration of the parameter  $\alpha$  (pheromone intensity controller),  $\beta$  (visibility controller) and  $\rho$  (pheromone volatilization intensity). After the proposed route from the calculation of the ACO and Hybrid NN-ACO algorithms is obtained, then a comparison is made between the proposed ACO, Hybrid NN-ACO routes, and the existing routes. It was found that the NN-ACO Hybrid algorithm produced a better value than the existing route and the ACO algorithm, namely minimizing the total mileage on Monday by 40.48%, Tuesday by 53.27%, Wednesday by 44.12%, Thursday by 47.85%, and Friday at 51.04%.*

***Keywords:*** *Distribution, Optimization, Ant Colony Optimization, Hybrid Nearest Neighbor-ACO, Carbon Emissions*